Highlights

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SPACE BALLOONS

Vanguard launching scheduled for today (Monday) will include a new magnetometer and an inflatable aluminized balloon. Successful balloon launch will lead to 100 foot aluminum-mylar sphere slated for this fall. Private industry, radio-tv interests, research organizations and amateur radio operators will soon be invited to participate in program by "bouncing" signals to and from the sphere at intercontinental distances. NASA will set up a special two-way communications system between Goldstone, Calif. and a point in New Jersey. Sphere will be placed in a 1000 mile orbit and plans call for inflation through vaporization of water. In addition to communications, such spheres can be used in testing ICBM defenses. In sufficient numbers they could also saturate or degrade ICBM or satellite warning systems.

RADIOISOTOPES AND INDUSTRY

New report to Atomic Energy Commission asserts that many industrial organizations reap large returns on investments from radioisotopes but only a very small percentage of American companies are availing themselves of the opportunity for cost savings and profit increases.

Preliminary survey by the National Industrial Conference Board shows:

* Who Benefits? -- When all uses of radioisotopes are considered together the petroleum industry reports the most benefit...followed closely by the chemical and allied products industry. A poor third, fourth and fifth are the tobacco, rubber and paper and allied products industries.
* How Does Industry Benefit?-- Nearly half the estimated savings in the petroleum industry comes from research applications. Gaging applications run a close second. A similar pattern of savings is reported by the chemical and allied product companies...However, in the tobacco, rubber and paper industries savings were derived almost entirely from gaging applications.
* A Wonder Tool? -- Study demonstrates that radioisotopes are not always the "wonder tool" management may expect. Companies in the same industry that are using radioisotopes for the very same purpose report widely different cost savings. In fact, some companies report net expenses rather than savings. On the other hand some firms are obtaining returns as much as 200 per cent above costs, or more.
* Some Complaints -- Industry is not always pleased with programs, applications, or regulation. Management cited technical gaging difficulties, false claims, arduous AEC requirements, high equipment costs, high maintenance expenses, high cost of compounds and the "costly nuisance" of waste disposal. Safety and health considerations may also be troublesome.

(Report not yet available. Watch SCIENCE TRENDS for details of public distribution.)

SPACE ENVIRONMENT RESEARCH

Problem areas in research and development for materials which must survive the space environment were outlined during the past week by Dr. Karl J. Pschera of the Army Ballistic Missile Agency. He cautions that while some information is available today concerning specific phenomena, "no conclusions can be drawn from extrapolated values or combinations of them."

Among the areas which require intensive research:

* Ultra High Vacuum: "It has been known for some time that certain metals and alloys lose weight under high vacuum exposure, particularly at high temperatures. Degassing of dissolved gases occurs. While gas diffusion through materials has been studied extensively a great deal of research work remains to be done."

Little is known about the mechanical properties of materials exposed to ultra high vacuum. Some materials are stronger in air at high temperatures and low stresses, but become stronger in vacuum at high stresses and low temperatures. These reversals have been explained by the assumption that oxidation hardens the metal and makes it stronger while surface absorption of gases lowers the surface energy and reduces the amount of work necessary to propagate cracks. Materials which are unstable under atmospheric conditions may turn out to be useful in space applications.

* Weightlessness: "This may cause creep and fatigue in inorganic compounds or materials. In space, vibrations may cause fatigue which would normally be dampened out in Earth's atmosphere."

* Radiation: "There is strong evidence that high energy radiation may cause severe changes in the surface conditions of materials due to repeated meltings and changes in general properties." Solar radiation is less of a problem as demonstrated by experiments in which large portions of the spectrum of electromagnetic waves have been simulated and their influence upon materials studied.

However, thermo-cycling is still of concern. Some metals may fail due to the alternate exposure to solar radiation and the intense cold of the shadow which occurs when a space vehicle's orbit places the Earth between it and the Sun. Thermal effects may be controlled by methods derived from studies of the reflectivity and emission of surface finishes and inorganic coatings. How materials behave under combined solar and cosmic radiation can only be extrapolated from nuclear radiation data. There is a wide open field for research.

Erosive Effects: Another "missing link" concerns the erosive effects of meteoric dust, micro-meteorites and meteoroids. Their speed is in excess of the fastest ballistic projectiles, their mass extends up to several thousand kilograms. Recent experiments reveal that different materials behave differently upon meteoric impact with respect to velocity, geometrical shape and mechanical properties of the meteorite. A tungsten carbide pellet was impacted against steel plate at a velocity of two kilometers per second and a crater 50 milimeters deep resulted. When the pellet's velocity was increased to 2.5 kilometers per second, only a superficial shallow pit resulted and the pellet was pulverized, illustrating the difficulty of providing adequate protection against impacts from particles in a wide range of velocities.

RESEARCH CHECKLIST

( ) High Temperature Alloys: Analysis of high-temperature alloys containing minute amounts of titanium, zirconium, niobium and tantalum and improved quality control for rocket and jet engines is made possible by a new procedure developed at the National Bureau of Standards. Method is based on the formation of soluble metal complexes which can be separated on an anion exchange column and retained for analysis.

(Report available. Free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C. for Summary Technical Report No. STR -2346)

( ) Vapor Lock Research: Studies for the U.S. Army at Southwest Research Institute have resulted in specific design proposals for elimination of vapor lock in automotive fuel systems. Investigation also covered fuel characteristics and effects of climate.

(Report available. 109 pages. $2.50. Write OTS, U.S. Dept., of Commerce, Washington 25, D.C. for PB 131 843)

( ) Plastic Fiber Research: Naval Research Laboratory is producing thermoplastic fibers one hundreth the diameter of human hair in connection with its aerosol filter program. Equipment uses an extrusion process in which a hot melt of thermoplastic material is forced through a row of fine orifices into two converging high-velocity streams of heated air. As the melt leaves the orifices, it is stretched to submicron diameters by the air stream and deposited on a moving screen in a random mesh.

(Research by Protective Chemistry Branch, Chemistry Division, U.S. Naval Research Laboratory, Washington 25, D.C.)

( ) Radio Telescope Research: Research at Ohio State University under National Science Foundation grant has led to development of a "unique" radio telescope which will utilize the rotation of the earth to map the radio sky from a wave length of 21 centimeters to about 20 meters. A fixed parabolic antenna is supplemented by a flat tiltable reflector.

(Further information from Information Office, National Science Foundation, Washington 25,D.C.)

( ) High Temperature Cements: Studies at the National Bureau of Standards have developed new information on the heat treatment of high temperature cements and refractory castables, such as those used in construction of missile launching pads at Cape Canaveral, Fla. Studies revealed a correlation between changes in mechanical properties and mineralogical composition.

(Report available. Free. Write Office of Technical Information, National Bureau of Standards, Washington 25, D.C. for Summary Technical Report No. 2285)

NAVY DATA PROCESSING

Data processing equipment installed at the Naval Missile Facility, Point Mugu, California, using a new pressure readout system, speeds up transmittal of preliminary reduced data from the previous one to three months to one or two days. Navy reports that this permits Bureau of Aeronautics contractors to receive test results weeks sooner, and enables them to reflect this saving in arriving at final designs.

Plans are underway to utilize electronic computer application in the establishment of a systematic process of correlating engine operating data. Navy hopes to develop actuarial engine life expectancies and failure tables for use in determining procurement requirements and overhaul schedules and for maintenance analysis.

All large industrial air stations may be equipped with data processing systems if pilot programs now underway at the Naval Air Stations at Alameda and North Island, California prove successful. Among other things, equipment is used to report actions on procurements in progress so that timely followup can be made on delays in commitment and obligation.

Near-Eastern crisis during 1958 proved to the Navy Bureau of Supplies and Accounts that data processing systems have prime advantages in making possible an orderly expansion of supply support in event of mobilization. During peacetime, new installations of data processing equipment at a number of shore installations have proved valuable in budget forecasting, inventory stratification, shipboard allowance preparation and maintenance of technical records.

Electronic accounting machines have been adopted by the Navy for all fleet units. The program for afloat electronic requisitioning is being put into effect throughout the Navy this year and will be extended to cover shore station transfers and internal ship and shore station requisitions. Navy estimates savings from use of EAM Cards over the cost of forms alone at some $700,000 per year.

ELECTRONIC AIDS FOR THE BLIND

Veterans Administration expects to spend about $142,000 next year in research and development on aids to the blind, chiefly electronic. Major new program calls for construction of a letter sounding device using any recorded alphabet or collection of sound to be keyed by punched teletypsetter tape similar to that used by newspapers. VA told Congress that MIT, Melpar or Fairchild are contractors under consideration.

Battelle Memorial Institute is expected to receive a $30,900 contract for construction of its Optophone type personal reading machines which convert printed material into audible tones. Hans A. Mauch R&D Laboratory is expected to receive a $30,000 contract for development of another personal reading machine; for speech-like sound output with single output per character and a potential reading speed said to be three times that of the Optophone.

Work on fundamental studies of audible outputs for reading machines will be performed under an estimated $20,000 contract with Haskins Laboratory, including work on tape-controlled library machines and on personal units and advances in operational capacity of recorded-dictionary reading machine previously built.

( ) Metal Damping Capacity: Research by the U.S. Bureau of Mines at its Rolla, Mo. laboratories is directed toward further knowledge of the shock-absorbing damping capacity of metals. Bureau scientists believe the knowledge gained can be more widely applied in architectural and engineering design, particularly in electronics and aircraft or missiles.

(Illustrated report available. Free. Write Bureau of Mines, Publications-Distribution Section, 4800 Forbes Avenue, Pittsburgh, 13, Pa. for Report of Investigations No. 5441 -- Damping Capacity)

( ) Aircraft Fires: Research by Walter Kidde and Co. for the U.S. Air Force has led to development of a fast, fully automatic system which is said to successfully prevent the start of fires after aircraft crashes. Crash-damage sensing devices inactivate all possible sources of ignition, shut off combustibles in nacelles, and de-energize the aircraft electrical system.

( ) New Vibration Analyzer: Stroboscope principles are used in a new instrument devised by the National Bureau of Standards said to be of value for study and testing of aircraft and missile structures. Device employs signals from vibration pickups which are mixed with a common signal differing slightly from the frequency at which the body is vibrated. The difference signal is then filtered from the combined frequency and displayed on an oscilloscope.

(Report available. Free. Write Office of Technical Information, National Bureau of Standards, Washington 25, D.C. for Summary Tech Report No. 2356)

( ) Molecular Generator: U.S. Government officials are circulating a report that the Physics Institute of the Academy of Sciences, USSR, has developed several generators in which molecules of ammonia emit radio waves. Claimed output is said to be stable enough to power an electric clock accurate within one second in 300 years. Applications are said to include long-range radar, precision timepieces, improved radio transmission and a new basis for measurement of physical and engineering values.

( ) Atomic Length Standards: National Bureau of Standards has under development two approaches said to hold promise for precise measurements beyond those presently required by research and technology. One approach is the atomic beam, which can be used as either an emission or an absorption source. The other is the Zeeman absorption filter which depends upon the splitting of spectral lines in a magnetic field. Both approaches have proved successful in producing very narrow lines whose wave lengths can be precisely determined.

(Report available. Free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C. for Summary Tech Report 2282.)

PUBLICATIONS CHECKLIST

( ) Missile and Space Activities, hearings before the Senate Preparedness Subcommittee this year on the "missile gap" and plans and programs of military and civilian space agencies. 271 pages. Free, as available. (Write Committee on Armed Services, Senate Office Building, The Capitol, Washington 25, D.C. for Joint Hearings, Preparedness)

( ) Congress and Atomic Energy, a handy guide to the Joint Committee on Atomic Energy and its subcommittees. Also outlines atomic energy legislation between 1946 and 1958 and lists publications, reports and hearings of the Committee during the same period. 16 pages. Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D.C. for Publication on Membership, Legislation and Publications.)

( ) Foreign Patents, a detailed study sponsored by Congress on the compulsory licensing of patents by large industrial nations and the possible use of such systems to preserve technical competition in the U.S. 51 pages. Single copies free. (Write Committee on Judiciary, U.S. Senate, Washington 25, D.C. for Patent Study No. 19)

( ) Air Power, a newly published Air Force survey of the history of Air Power including current air research and development, procurement, and the aircraft industry. Second half of the volume includes chapters on elements of an aircraft, aerodynamics and lift; stability, control, navigation and guidance, propulsion systems and space vehicles. 324 pages. $3. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. D 301.63:Ai 7)

( ) Radioactive Waste Disposal, a technical report on the disposal of acid aluminum nitrate high-level radioactive waste solutions from power reactor operations. Surveys injections of such waste into deep-lying rock strata. 65 pages. 40 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. I 19.3:1088)

( ) Aerial Photography, covers specifications for aerial surveys and mapping by photogrammetric methods for highways. Designed to help both the purchaser and producer in proper selection of appropriate items. 123 pages. 75 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. C 37.6/2:Ae 8)

( ) Congress and Science, a survey of developments during the past year dealing with science and Congress. Includes material on proposals for a Federal Department of Science and Technology. 172 pages. Free if available. (Write Senate Committee on Government Operations, New Senate Office Building, Washington 25, D.C. for Report No. 120)

( ) Radio Receivers, a Defense department manual just reprinted and designed to serve as a basic text on radio receivers. Describes fundamentals of basic design as well as new techniques such as subminiature tubes and plug-in units. Also discusses performance tests and trouble-shooting techniques. 175 pages. $2.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. D 301.7:100-5)

( ) Space Programs, testimony and hearings on programs of the National Aeronautics and Space Administration. Covers research, development, procurement. 180 pages. Free as available. (Write Committee on Aeronautical and Space Sciences, Senate Office Building, Washington 25, D.C. for NASA Supplemental Authorization Hearings.)